Vegetation – Overstory Trees

This document describes methods for monitoring changes in density and basal area of overstory trees in forest or woodland areas. The sampling unit is a permanently marked plot of adjustable size and shape where individual trees are mapped and tagged. Attributes observed include tree species, diameter, crown position, snag classification, and visible damage. These methods were developed for the National Park Service's (NPS) fire monitoring program but may be adapted for other monitoring purposes. For background information on the fire monitoring program, including the purpose and overview of the program, related policy, and personnel responsibilities, refer to Chapter 1, pages 1-5 of the NPS Fire Monitoring Handbook (FMH, http://www.nps.gov/fire/fmh/FEMHandbook.pdf). An overview of management objectives and the process for developing corresponding monitoring program objectives is reviewed in Chapter 3, pages 19-32 of the FMH.

Sampling design, including defining the population of interest, pilot sampling, calculating minimum sample size, and addressing potential design problems, is described in FMH Chapter 4, pages 33-54. Methods for generating and selecting plot locations and installing plots are found in FMH Chapter 5, pages 59-79. The schedule for monitoring prior to and following fire treatment is located in FMH Chapter 5, pages 55-58, although the schedule may be revised for other purposes. For a list of field equipment needs recommended for implementing this protocol, see FMH Appendix E, pages 221-224. Information about monitoring program file maintenance and data storage is found in FMH Chapter 5, pages 112-113. To review data quality procedures, see FMH Chapter 5, pages 114-117.

The field methods for the protocol described below are taken from FMH Chapter 5, pages 91-99 (http://www.nps.gov/fire/fmh/FEMHandbook.pdf). Specific forms developed for field data collection follow the protocol description.

Monitoring Overstory Trees

Overstory trees are defined in this handbook as living and dead trees with a diameter at breast height (DBH) of >15 cm. Diameter at breast height is measured at breast height (BH) 1.37 m (4.5 ft) from ground level. You may modify this definition for your purposes; see page 44 for details.

Overstory Tree Accuracy Standards

Accuracy standards for each variable discussed in this section are listed at the end of this section (Table 21, page 99).

TAG AND MEASURE ALL OVERSTORY TREES

RS Procedures

Measure DBH for and tag all overstory trees within the sampling area chosen during the monitoring design process (see page 44). Check your protocols (FMH-4) before proceeding. Living and dead trees are tagged with sequentially numbered brass tags nailed into the trees at BH (for each plot, use tag numbers different from those used for the pole-size trees, e.g., 1-100 for poles and 500-600 for overstory). Orient the tags so that each faces the plot center (see Figure 25), except in areas (e.g., near trails) where you will need to orient the tags to make them less visually obtrusive.

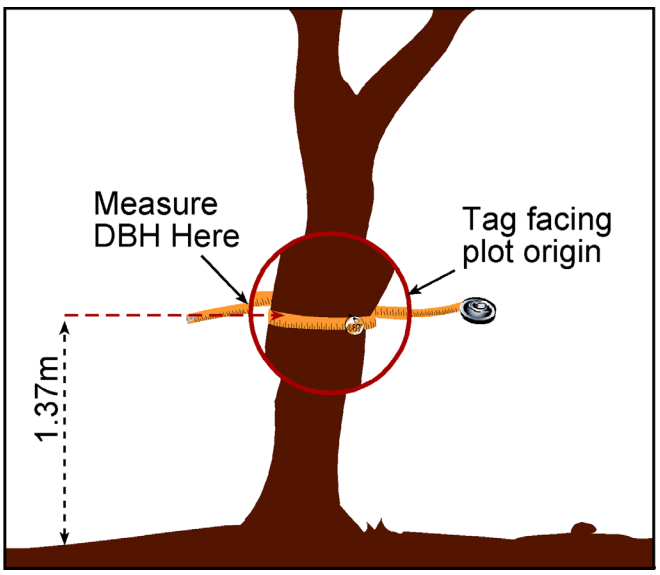

Figure 25. DBH measurement and tag placement.

For a tree on a slope, determine the DBH while standing at the midslope side of the tree. Measure the DBH of a leaning tree by leaning with the tree and measuring perpendicular to the bole.

First, drive an aluminum nail into the tree at BH, so that the tag hangs down and away from the tree and several centimeters of nail remains exposed, leaving ample space for tree growth.

Second, measure DBH (in centimeters) to the nearest mm, just above the nail. Include trees on the plot boundary line if >50% of their bases are within the plot. Start in Quarter 1 and tag through Quarters 2, 3, and 4 consecutively.

For non-sprouting tree species forked below BH, individually tag and measure each overstory-size bole (Figure 26). For sprouting tree species, tag and measure only the largest bole (in diameter) of the cluster. For clonal tree species, e.g., aspen, treat each bole as an individual tree. Tally seedling-size sprouts as resprout class seedlings until they grow into the pole tree size class. **Note:** If the main bole of a sprouting species has died, but the tree is sprouting from the base, consider the main bole dead.

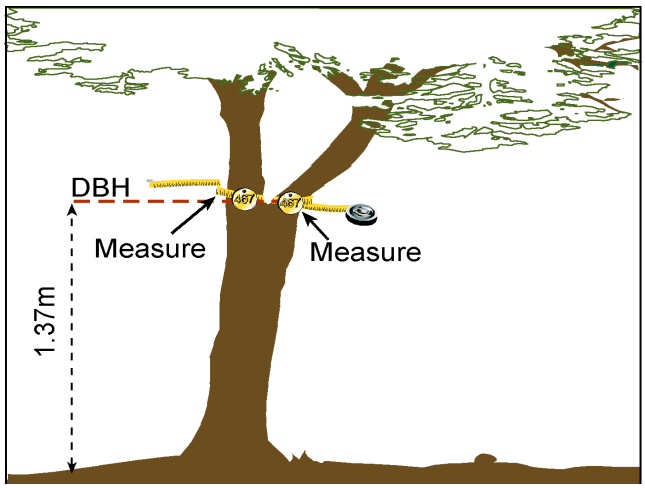

Figure 26. DBH measurement for non-sprouting trees forked below BH.

If the bole of a fallen tree is below BH, and the individual is resprouting, treat the sprouting branches as individuals and place them in the appropriate size class (seedling, pole, or overstory). Include clarifying comments on the data sheet, especially for resprouting trees.

Sampling Problems with DBH

Note: The following tips are additions to this handbook; incorporate them with caution.

Swelling at BH If a swell or other irregularity occurs at the standard 1.37 m height for DBH, place the tag above or below the swell and DBH measured at the tag. Make every attempt to keep the tag (and thus the DBH measurement) between 1 and 2 m above the ground, trying above the obstruction first. If you do not measure DBH at BH, note this on the data sheet (Comments) (See Figure 27).

Void at BH

If you find a void caused by a fire scar or other abnormality, and a large part of the bole is missing at BH, and it would be impractical to simply measure above or below it, it may be necessary to estimate what the DBH would be, were the bole intact. If this is done, be sure to note in the comments field that the DBH was estimated (See Figure 28).

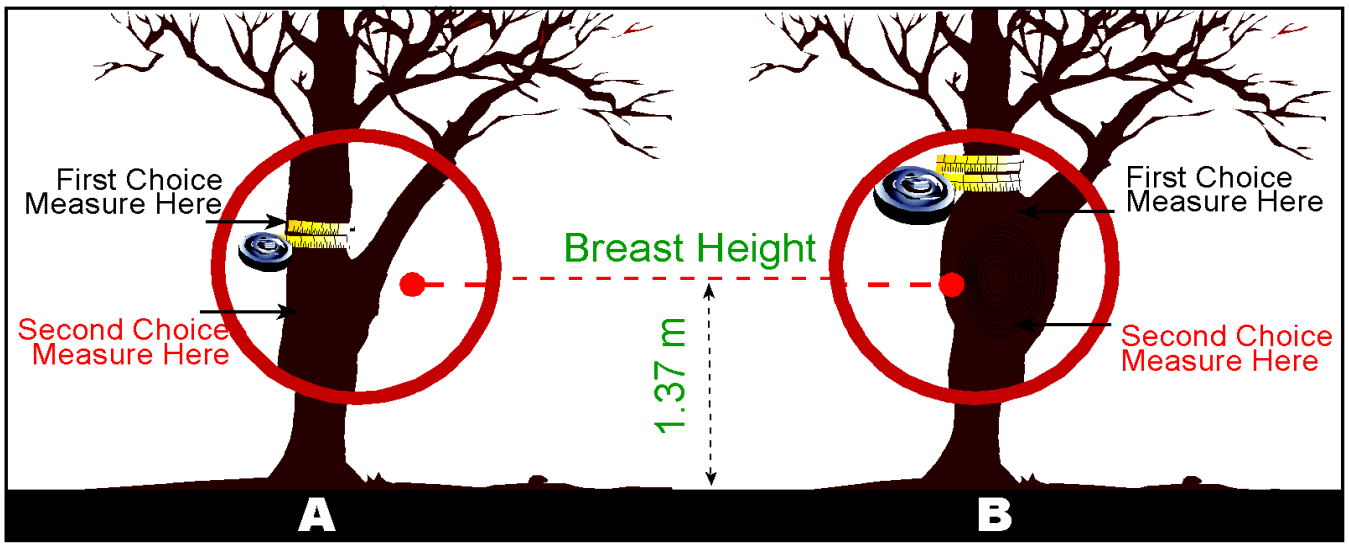

Figure 27. Handling irregularities at BH.
A) a tree with a branch at BH, B) a tree with a swell at BH.

Measure DBH

Wrap a diameter tape (not a standard tape) around the tree in the plane of the nail, making sure the tape does not sag, and read the diameter. Take care to read at the measurement line, not at the end of the tape. Record the heading information on Overstory tagged tree data sheet (FMH-8 in Appendix A). For all overstory trees, record the plot quarter in which the tree occurs (Qtr), the tree tag number (Tag), species (Spp), and diameter (DBH), and circle whether the tree is alive. Record miscellaneous overstory tree information in Comments. Map each overstory tree by tag number on the appropriate tree map (FMH-11, -12, -13, or -14).

Measuring DBH without a Diameter Tape

If you do not have (or have forgotten) a diameter tape, you can use a standard tape to measure circumference, and then calculate diameter as follows:

$$DBH = \frac{circumference}{\pi}$$

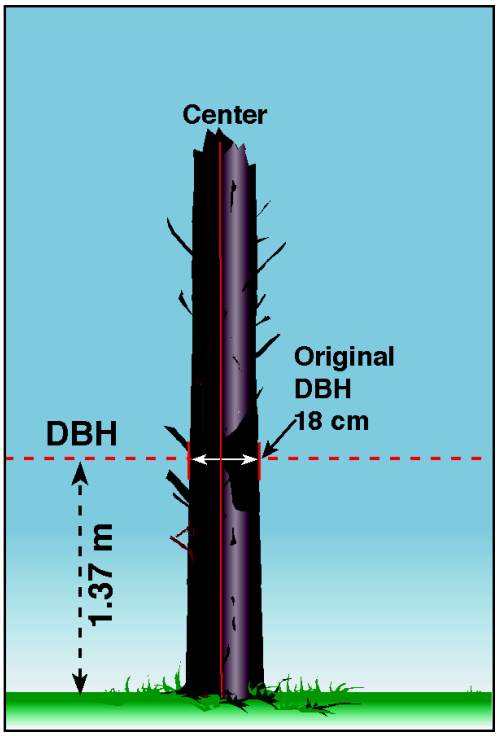

Figure 28. Reconstruct DBH when it would provide a better estimate of the regular bole of the tree.

Toxic Plants at DBH

If toxic plants embrace the bole at BH, carefully place the tag at an appropriate location. It may also be acceptable to estimate DBH in some cases, after consultation with resource and fire specialists.

OPTIONAL MONITORING PROCEDURES

Crown Position and Tree Damage

If possible, also monitor the optional variables crown position (CPC) and tree damage (Damage). Space is provided on the FMH-8 data sheet for these data.

Crown position

Crown position, an assessment of the canopy position of live overstory trees (Avery and Burkhart 1963), is recorded in the column marked CPC (crown position code) using a numeric code (1–5) (see Table 17, page 94 and Figure 29, page 94). Codes for dead trees (Thomas and others 1979) can also be recorded using numeric snag classes (6–12) (see Table 18, page 95 and Figure 30, page 95).

During the immediately postburn visit use the "Live" column on FMH-20 for CPC codes (10–12). Use (C) for dead and down or completely consumed (CPC 10), (B) for broken below DBH (CPC 11), and (S) for cut stump (CPC 12). Note that these three codes are used only once during data collection.

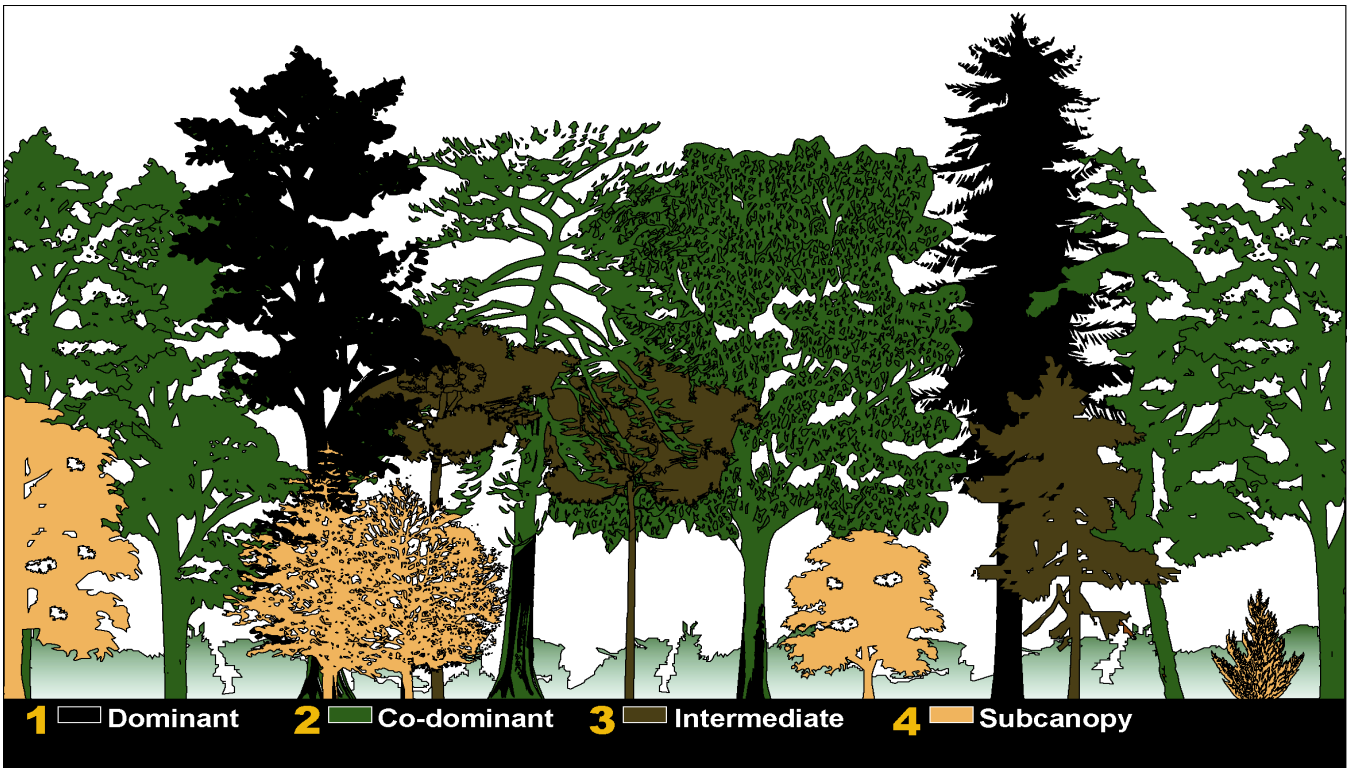

Figure 29. Crown position codes for live trees.
A fifth code (5) is used for isolated trees.

Table 17. Descriptions of live tree crown position codes.

1 Dominant	Trees with crowns extending above the general level of the crown cover, and receiving full light from above and at least partly from the side; these trees are larger than the average trees in the stand and have well-developed crowns, but may be somewhat crowded on the sides.
2 Co-dominant	Trees with crowns forming the general level of the crown cover and receiving full light from above, but comparatively little from the sides; these trees usually have medium-size crowns, and are more or less crowded on the sides.
3 Intermediate	Trees shorter than those in the two preceding classes, but with crowns either below or extending into the crown cover formed by co-dominant and dominant trees, receiving little direct light from above, and none from the sides; these trees usually have small crowns and are considerably crowded on the sides.
4 Subcanopy	Trees with crowns below the general level of the crown cover and receiving no direct light from above or from the sides.
5 Open Growth/ Isolated	Trees receiving full sunlight from above and all sides. Typically, these are single trees of the same general height and size as other trees in the area, but where the stand is open and trees are widely separated so dominance is difficult to determine.

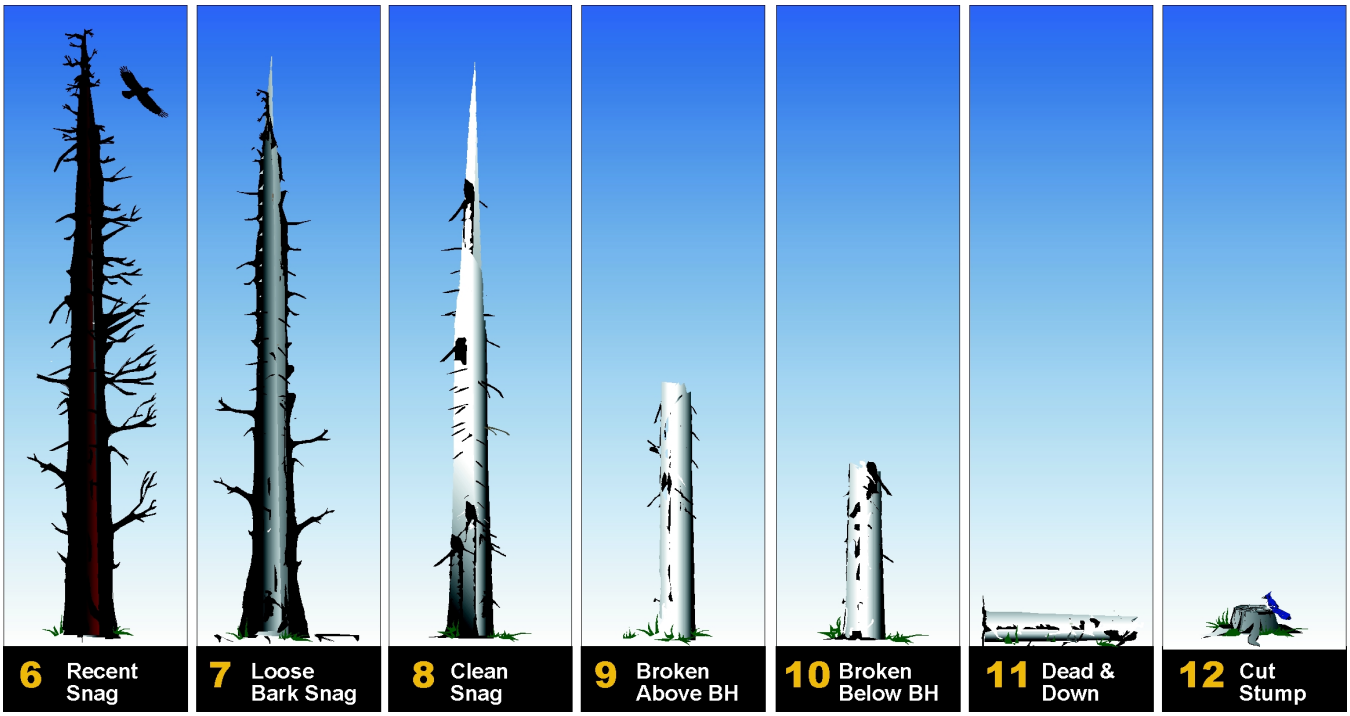

Figure 30. Crown position codes for dead trees.

Table 18. Descriptions of dead tree crown position codes.

6	**Recent Snag**	Trees that are recently dead with bark intact. Branches and needles may also be intact.
7	**Loose Bark Snag**	Trees that have been dead several years on which the bark is partially deteriorated and fallen off; tops are often broken.
8	**Clean Snag**	Trees that have been dead several years with no bark left. Usually most of the branches will be gone as well; tops are often broken.
9	**Broken Above BH**	Trees that have been dead a long time with no bark, extensive decay, and that are broken above BH.
10	**Broken Below BH**	Postburn trees that extended above BH preburn, but no longer do. **Note:** Only record data for a tree the first time you find it broken.
11	**Dead and Down**	Postburn trees that stood preburn and have since fallen or been consumed. **Note:** Only record data for a tree the first time you find it down.
12	**Cut Stump**	Postburn trees that stood preburn and has been cut as a result of fire operations. **Note:** Only record data for a tree the first time you find the stump.

Crown Position Codes (CPC)

Earlier editions of the Fire Monitoring Handbook (USDI NPS 1992) used only the first four crown position codes. For plots established earlier, there is no harm in adopting this new protocol and assigning codes to snags after plots have burned. As plots are revisited according to their normal schedule, previously dead trees should be assessed for their snag codes. An effort can also be made to determine what the code might have been at the previous visits. For example, a clean snag (CPC 8) encountered during the year-2 visit was probably a clean snag at year-1, and possibly even at preburn. Any estimated data should be added to the database retroactively for those previous visits along with a comment noting that the CPC is a guess. In many cases a comment might have been made as to the status of the snag during the past visit.

Data Collection on Trees with a CPC of 10–12

Only collect data for trees that are newly fallen, consumed, cut, or broken below BH (CPC 10–12) the first time you encounter them **after** the preburn visit. Never record a dead and down, cut, or broken below BH tree during the preburn visit. Once you record data for a newly fallen, consumed, broken, or cut tree, **ignore** it in your tree density data collection from that point onward. For example, if you find a tree with a CPC of 11 during the immediate postburn visit, for your year-1 re-measurement of that plot you would not record any data for that tree.

Immediate postburn—See page 111 under "Scorch Height."

Year-1 postburn and beyond—For a dead tree with a CPC of 10–12 that you encounter in year-1 and beyond, you only need to record data for that tree once. For example, a tree's bole breaks off below BH **between** the year-1 and year-2 plot visits. You would assign this tree a CPC of 10 in the year-2 visit, and then in subsequent visits you would not record any data for that tree.

Tree damage

You may wish to identify living overstory trees exhibiting signs of stress (loss of vigor) before the burn. By doing this you can infer that if those trees die relatively soon following the fire, their death may not be wholly attributable to the fire, but to a combination of factors.

The monitor's ability to evaluate preburn damage will determine the value of the data. A trained specialist will undoubtedly observe more than a novice in the field. **Note:** Appendix G contains several forest pest and disease references; see page 232.

The following list (Table 19) of structural defects and signs of disease is simplistic (and certainly not all-inclusive), but should serve as a useful guideline. Parks may add categories to include damage of local importance in the "Comments" column. Record these data for living overstory trees (tree damage assessment is optional for dead trees) under Damage on the FMH-8 form in Appendix A.

Table 19. Damage codes for overstory trees.

ABGR	Abnormal growth pattern for the species of concern. This category would include a range of physical deformities not included in the remainder of the damage codes.
BIRD	Bird damage such as woodpecker or sapsucker holes.
BLIG	Blight is generally defined as any plant disease or injury that results in general withering and death of the plant without rotting. Blight can result from a wide variety of needle, cone, and stem rusts, as well as canker diseases, and is often species- or genus-specific. Consultation with local plant pathologists may assist in identifying specific blight conditions.
BROK	Broken top of the tree.
BROM	Witches' broom diseases are characterized by an abnormal cluster of small branches or twigs on a tree as a result of attack by fungi, viruses, dwarf mistletoes, or insects. Brooms caused by dwarf mistletoe and from yellow witches' broom disease are common in the west.
BURL	A hard, woody, often rounded outgrowth on a tree. This occurs naturally in some tree and shrub species, and is a sign of an infection or disease in other species.
CONK	The knobby fruiting body of a tree fungal infection visible on a tree bole, such as a shelf fungus.
CROK	Crooked or twisted bole for species in which this is uncharacteristic.
DTOP	Dead top.
EPIC	Epicormic sprouting, adventitious shoots arising from suppressed buds on the stem; often found on trees following thinning or partial girdling.
EPIP	Epiphytes present.
FIRE	Fire scar or cambial damage due to fire.

Table 19. Damage codes for overstory trees. (Continued)

FORK	Forked top of a tree or multiple primary leaders in a tree crown for species in which this is uncharacteristic. Forks assume vertical growth and should be distinguished from branches, which assume horizontal growth.
FRST	Frost crack or other frost damage.
GALL	Galls found on stems, leaves or roots. Galls are formed by infection of the plant by bacteria or fungi, or by an attack by certain mites, nematodes, or insects, most notably wasps.
HOLW	Hollowed-out trees. Repeated hot fires can burn through the bark and the tree's core may then rot out, especially in trees with tough bark, but soft heartwood, e.g., sequoia, coast redwood. These hollowed-out trees are sometimes called "goose pens" because early settlers kept poultry in them.
INSE	Visible insects in the tree bole or the canopy, or their sign, such as frass, pitch tubes or bark beetle galleries.
LEAN	Tree is leaning significantly. If on a slope, tree deviates considerably from plumb.
LICH	Lichens present.
LIGT	Lightning scar or other damage to the tree caused by lightning.
MAMM	Damage caused by mammals, such as bear claw marks, porcupine or beaver chewings, and deer or elk rubbings.
MISL	Mistletoe is visible in the tree (as opposed to signs of mistletoe, such as broom, without visible mistletoe).
MOSS	Moss present.
OZON	Ozone damage. Ozone injury is often seen in the form of stippling or speckling on the leaves or needles of trees. This discoloration varies among species and ranges in color from red or purple to yellow or brown. Susceptible species often drop their leaves prematurely.
ROOT	Large exposed roots.
ROTT	A rot of fungus other than a conk, often associated with a wound or crack in a tree.
SPAR	Unusually sparse foliage for that species and size of tree.
SPRT	Basal sprouting; new shoots arising from the root collar or burl.
TWIN	A tree that forks below BH and has two or more boles. Use this code for tree species that typically have single boles.
UMAN	Human-caused damage such as axe marks, embedded nails or fence wire, or vandalism.
WOND	A wound to a tree that cannot be identified by one of the other damage codes, including wounds or cracks of unknown cause.

Damage Codes

Some damage codes may not be applicable to all species. For example, some species of oak are characterized by complex forking above BH, so the FORK code would not indicate damage or abnormality and would not be of use.

If several types of insect damage are present, it may be desirable to distinguish among them in the comments field on the FMH-8.

After the initial preburn data collection visit, you may find it advantageous to copy the damage codes, crown position codes and comments from the previous visit's tagged tree data sheet to the current visit's data sheet. This will encourage consistency between visits and minimizes the risk of one data collector seeing something like mistletoe one year, the next year's data collector missing it and the subsequent visit's collector seeing it again, leading to the erroneous assumption that it has actually come and gone. **Note:** Document any damage noted in past years that you could not find.

Measuring Diameter at Root Crown (DRC) for Woodland Species

Measurement of a tree's diameter at root crown is an alternative to DBH measurements for tree species that are typically highly forked. **Note:** Do not use this method for unusual individual trees that have many boles. With this method, trees with stems that fork underground, or with several stems clumped together that appear to be from the same root origin, are treated as a single tree. The single diameter of the root crown should be measured directly if branching occurs above ground and the single diameter accurately reflects the cumulative volume of the stems it supports. Alternatively, if the stems fork below ground level, or the base is deformed and its diameter would grossly overestimate the volume of the individual stems, the DRC should be calculated from the individual stem diameters (see page 214, Appendix D for this equation).

To measure a single stem, or each of multiple stems forked underground, carefully remove the loose material to the mineral soil (remember to replace it when finished) at the ground line or stem root collar, whichever is higher. Measure DRC just above any swells present, and in a location such that the diameter measurements are reflective of the volume above the

stems. For measurement of multiple stems, forked above ground, measure DRC just above the fork, and above any swells (see Figure 31).

Where a stem is missing or damaged, estimate what its diameter would have been. If a stem is now dead, but previously contributed to the crown, count it. Individual stems must be (or have been prior to damage) at least 1.37 m tall and must have a DRC of at least 2.5 cm to qualify for measurement.

Attach a tag (optional) to the largest or main stem, facing the plot origin and approximately one foot above ground level.

Diameter at Root Crown

Diameter at root crown is a new addition to the handbook with this edition. Resource and fire managers may determine that it would be a more useful measure for a given species than diameter at breast height (DBH). If this is the case, then both methods should be used for a minimum of two years, or until a correlation between DBH and DRC can be established for that species at that site.

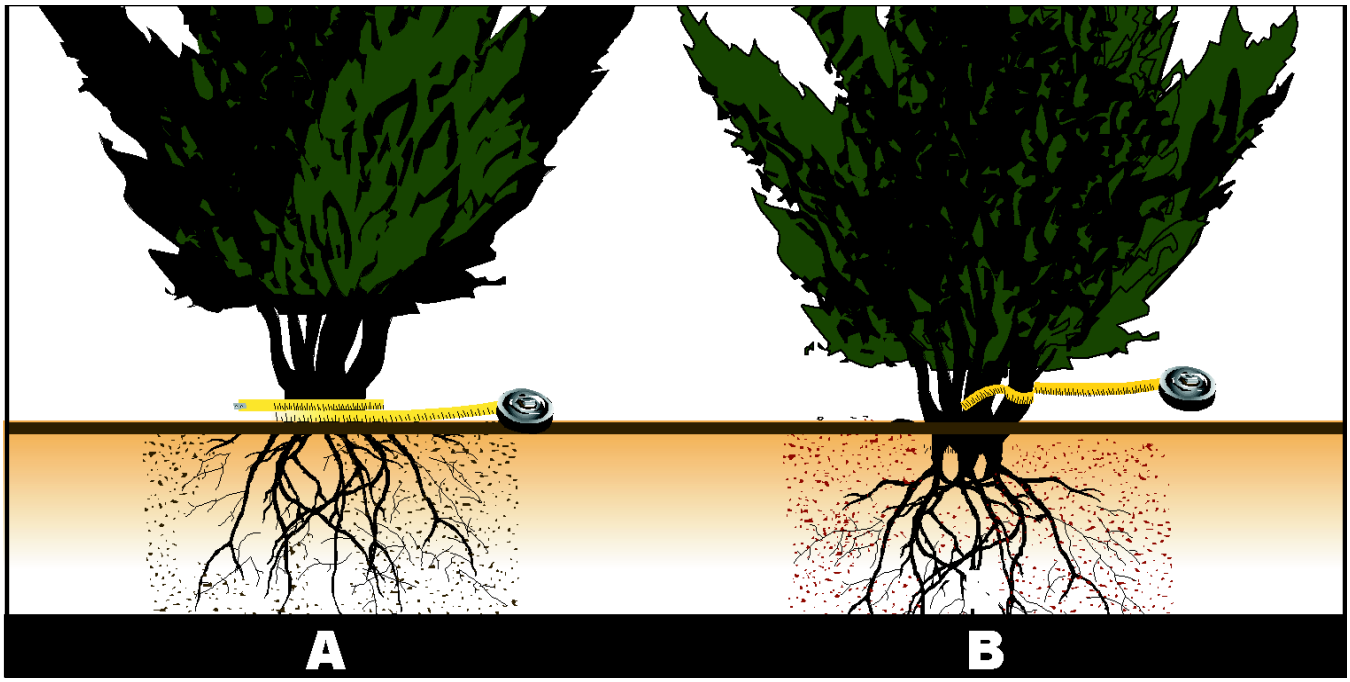

Figure 31. Measuring multiple stems forked above ground with DRC.
Measure just above the fork, and above any swells. Measurement of: A) multiple stems forked above ground, B) single stems, or stems forked underground.

Diameter Groupings

Overstory trees. This includes single-stemmed trees >15 cm DRC and multi-stemmed trees with a cumulative DRC >15 cm (though you can modify this definition; see page 44).

Pole-size trees. This includes single-stemmed trees between 2.5 cm and 15 cm DRC, and multi-stemmed trees with a cumulative DRC between 2.5 cm and 15 cm (though you can modify this definition; see page 44).

For trees with several small stems, the following guidelines (Table 20) may help in determining whether a tree will qualify as an overstory tree (if there is any question, measure the stems).

Table 20. Guidelines to determine whether a tree is considered an overstory tree.

Approximate Stem Size (cm)	Approx. Number of Stems Needed to Exceed 15.0 cm DRC
10.5	2
8.5	3
5.0	9
3.5	18
2.5	35

Table 21. Accuracy standards for overstory tree (RS) variables.

Overstory Tree		
DBH/DRC	15.1–50 cm	± 0.5 cm
	51–100 cm	± 1 cm
	>100 cm	Not Applicable
Tree Damage		Best Judgment
Crown Position		Best Judgment
# of Individuals		± 5%

Park/Unit 4-Character Alpha Code: _____

FMH-8 **OVERSTORY TAGGED TREE DATA SHEET** Page __ of __

Plot ID: _____ B / C (Circle One) Date: ____/____/____

Burn Unit: _____ Recorders: _____

Burn Status:Circle one and indicate number of times treated, e.g., 01-yr01, 02-yr01

00-PRE ____ Post ____-yr01 ___-yr02 ___-yr05 ___-yr10 ___-yr20Other: ___-yr___; ____-mo___

Record: quarter (Qtr), tag #, species by code (Spp), DBH in centimeters, live/dead, crown position code (CPC, Optional), damage code (Damage, Optional), and provide any helpful comments for data analysts or future monitors (Comments).

Qtr	Tag	Spp	DBH (cm)	Live	CPC	Damage (codes below)	Comments
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			

Crown Position Codes (CPC) **Note:** Codes 10–12 are only used postburn, e.g., 01-yr01, 01-yr02, etc., and only used once:

1	Dominant	**2**	Co-dominant	**3**	Intermediate	**4**	Subcanopy
5	Open Growth / Isolated	**6**	Recent Snag	**7**	Loose Bark Snag	**8**	Clean Snag
9	Broken above BH	**10**	Broken below BH	**11**	Dead and down	**12**	Cut Stump

Damage Codes:

ABGR—Abnormal Growth	CONK—Large Shelf Fungus	FIRE—Fire Scar / Cambial Damage	INSE—Insects / Their Sign	MISL—Mistletoe	SPAR—Unusually Sparse Foliage
BIRD—e.g., Sapsucker	CROK—Crooked Bole	FORK—Forked Top	LEAN—Leaning Tree	MOSS—Moss	SPRT—Sprouts at Base
BLIG—Blight	DTOP—Dead Top	FRST—Frost Crack	LICH—Lichen	OZON—Ozone	TWIN—Twin–below DBH
BROK—Broken Top	EPIC—Sprouts from Bole / Limbs	GALL—Galls	LIGT—Lightning Scar	ROOT—Large Exposed Roots	UMAN—Human-caused Damage
BROM—Witches' Broom	EPIP—Epiphytes	HOLW—Hollowed-out	MAMM—Mammal Damage	ROTT—Rot / Fungus Other than Conk	WOND—Wound–cracks
BURL—Burl					

Date Entered: ____/____/____

Qtr	Tag	Spp	DBH (cm)	Live	CPC	Damage	Comments
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
				Y N			
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				Y N			
				Y N			
				Y N			
				Y N			

Park/Unit 4-Character Alpha Code: _____

FMH-4 **MONITORING TYPE DESCRIPTION SHEET**

Monitoring Type Code: _____ Date Described: __/__/__

Monitoring Type Name: _____

FGDC Association(s): _____

Preparer(s) (FEMO/RMS/FMO): _____

Burn Prescription (including other treatments: _____

Management Objective(s): _____

Monitoring Objective(s):_____

Objective Variable(s): _____

Physical Description: _____

Biological Description:_____

Rejection Criteria:_____

Notes:_____

Date Entered: ____/____/____

PLOT PROTOCOLS

GENERAL PROTOCOLS		(Circle One)			(Circle One)	
Preburn	Control Treatment Plots (Opt)	Y	N	Herb Height (Opt)	Y	N
	Herbaceous Density (Opt)	Y	N	Abbreviated Tags (Opt)	Y	N
	OP/Origin Buried (Opt)	Y	N	Herb. Fuel Load (Opt)	Y	N
	Voucher Specimens (Opt)	Y	N	Brush Fuel Load (Opt)	Y	N
	Count Dead Branches of Living Plants as Dead (Opt)				Y	N
	Width Sample Area Species Not Intercepted But Seen in Vicinity of Herbaceous Transect(s):					
	Length/Width Sample Area for Shrubs:			Stakes Installed:		
	Herbaceous Frame Dimensions:					
	Herbaceous Density Data Collected At:					
Burn	Duff Moisture (Opt)	Y	N	Flame Depth (Opt)	Y	N
Postburn	100 Pt. Burn Severity (Opt)	Y	N	Herb. Fuel Load (Opt)	Y	N
	Herbaceous/Shrub Data (Opt): FMH- 15/16/17/18					

FOREST PLOT PROTOCOLS		(Circle One)			(Circle One)	
Overstory (>15 cm)	Live Tree Damage (Opt)	Y	N	Live Crown Position (Opt)	Y	N
	Dead Tree Damage (Opt)	Y	N	Dead Crown Position (Opt)	Y	N
	Record DBH Year-1 (Opt)	Y	N			
	Length/Width of Sample Area:			Quarters Sampled: Subset • Q1 • Q2 • Q3 • Q4		
Pole-size (≥2.5≤15)	Height (Opt)	Y	N	Poles Tagged (Opt)	Y	N
	Record DBH Year-1 (Opt)	Y	N	Dead Pole Height (Opt)	Y	N
	Length/Width of Sample Area:			Quarters Sampled: Subset • Q1 • Q2 • Q3 • Q4		
Seedling (<2.5 cm)	Height (Opt)	Y	N	Seedlings Mapped (Opt)	Y	N
	Dead Seedlings (Opt)	Y	N	Dead Seedling Height (Opt)	Y	N
	Length/Width of Sample Area:			Quarters Sampled: Subset • Q1 • Q2 • Q3 • Q4		
Fuel Load	Sampling Plane Lengths:___ 1 hr • ___ 10 hr • ___ 100 hr • ___ 1,000 hr-s • ___ 1,000 hr-r					
Herbaceous	Cover Data Collected at: Q4–Q1 • Q3–Q2 • 0P–50P • Q4–30 m					
Postburn	Char Height (Opt)	Y	N	Poles in Assessment (Opt)	Y	N
	Collect Severity Along: Fuel Transects • Herbaceous Transects					

(Opt) = Optional

Park/Unit 4-Character Alpha Code: _____

FMH-5 **PLOT LOCATION DATA SHEET**

Plot ID: _____ B / C (Circle One) Date: ___/___/___

Burn Unit: _____ Recorder(s): _____

Topo Quad: _____ Transect Azimuth: ____ Declination: _____

UTM ZONE: _____	Lat: _____	Section: _____	Slope (%) along Transect Azimuth: _____
UTMN: _____	Long: _____	Township: _____	Slope (%) of Hillside: _____
UTME: _____		Range: _____	Aspect: _____ Elevation: _____

Location Information Determined by (Circle One): Map & Compass / GPS

If determined by GPS: Datum used: _____ (Circle One) PDOP/EHE: _____

Fire History of the Plot (including the date of the last known fire):_____

_____

1. Road and trail used to travel to the plot:_____

_____

_____

2. True compass bearing at point where road/trail is left to hike to plot: _____°

3. Describe the route to the plot; include or attach a hand-drawn map illustrating these directions, including the plot layout, plot reference stake and other significant features. In addition, attach a topo, orthophoto, and/or trail map.

4. Describe reference feature: _____

5. True compass bearing from plot reference feature to plot reference stake: _____°

6. Distance from reference feature to reference stake: _____m

7. Problems, comments, notes:_____

_____

_____

FMH-5A **HISTORY OF SITE VISITS**

Plot ID: ________________ B / C (Circle One) Burn Unit: ________________________

Date	Burn Status	Purpose	Comments

Date Entered: ____/____/____

Park/Unit 4-Character Alpha Code: _____

FMH-6 **SPECIES CODE LIST** Page ___ of ___

Use this form to record unknowns and official species codes. **Tip:** Place an asterisk next to each species you voucher.

Species Code	Life Form	Genus/Species (spell out full name)	Native (Circle One)	Annual/ Biennial/ Perennial
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	
			Y N	

Life Forms Codes:

A	Fern or Fern Ally	**G**	Grass	**R**	Grass-like	**T**	Tree	*****	Substrate
F	Forb	**N**	Non-vascular	**S**	Shrub	**U**	Subshrub	**V**	Vine

Date Entered: ___/___/___

VOUCHER SPECIMEN DATA COLLECTION FORMS

Date: Plot ID: Collected by: Coll. #

Latin Name: Family:

Common Name:

Description: ann/bien/per Life form: ht.: Habitat:
flr. color: other:
fruit type:

Topo Quad: Assoc. spp.:

Location (UTM, lat/long): Elev.: Slope: Aspect:

Comments:

Date: Plot ID: Collected by: Coll. #

Latin Name: Family:

Common Name:

Description: ann/bien/per Life form: ht.: Habitat:
flr. color: other:
fruit type:

Topo Quad: Assoc. spp.:

Location (UTM, lat/long): Elev.: Slope: Aspect:

Comments:

Date: Plot ID: Collected by: Coll. #

Latin Name: Family:

Common Name:

Description: ann/bien/per Life form: ht.: Habitat:
flr. color: other:
fruit type:

Topo Quad: Assoc. spp.:

Location (UTM, lat/long): Elev.: Slope: Aspect:

Comments:

Date: Plot ID: Collected by: Coll. #

Latin Name: Family:

Common Name:

Description: ann/bien/per Life form: ht.: Habitat:
flr. color: other:
fruit type:

Topo Quad: Assoc. spp.:

Location (UTM, lat/long): Elev.: Slope: Aspect:

Comments:

Park/Unit 4-Character Alpha Code: _____

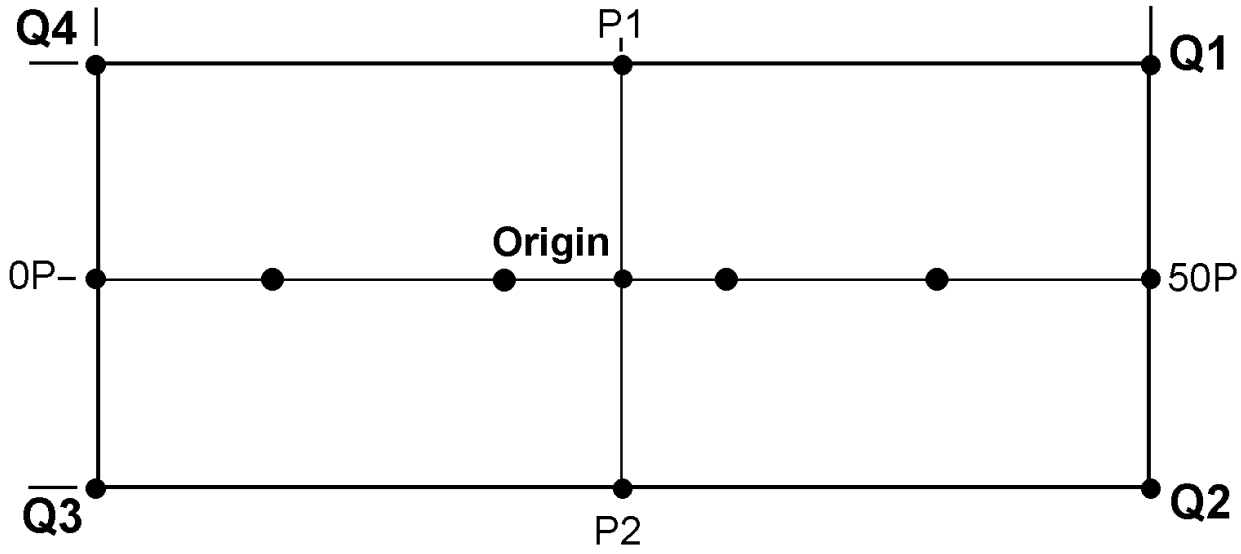
FMH-7 **FOREST PLOT DATA SHEET**

Plot ID: _____ B / C (Circle One) Date: ____/____/____

Burn Unit: _____ Recorders: _____

Burn Status:Circle one and indicate number of times treated, e.g., 01-yr01, 02-yr01

00-PRE ____ Post ____-yr01 ___-yr02 ___-yr05 ___-yr10 ___-yr20Other: ___-yr___; ____-mo___



Overstory: _____m^2 in Q ____ Pole: _____m^2 in Q _____ Seedling: _____m^2 in Q ____

Sampling Areas: Shrub: _____m^2 along Q4–Q1 • Q3–Q2 • 0P–50P • Q4–30 m

Shade in the sampling areas for each tree class and for the shrub sampling area(s) on the plot layout above.

Photo Subject Order		**Fuel Load Transects**		
			Azimuth	Slope
1. 0P → Origin	6. Q2 → Q3			
2. Q4 → Q1	7. P2 → Origin	1		
3. P1 → Origin	8. Q3 → Q2	2		
4. Q1 → Q4	9. Origin → REF	3		
5. 50P → Origin	10. REF → Origin	4		

Record photo documentation data for each visit on FMH-23, Photographic record sheet

Draw in fuel load transect lines on the plot layout above.

Date Entered: ____/____/____

Park/Unit 4-Character Alpha Code: _____

FMH-11 **FULL PLOT TREE MAP**

Plot ID: _____ B/C (Circle One) Date: ____/____/____

Burn Unit: _____ Recorders: _____

Burn Status:Circle one and indicate number of times treated, e.g., 01-yr01, 02-yr01

00-PRE ____ Post ____-yr01 ___-yr02 ___-yr05 ___-yr10 ___-yr20 Other: ___-yr____; ____-mo___

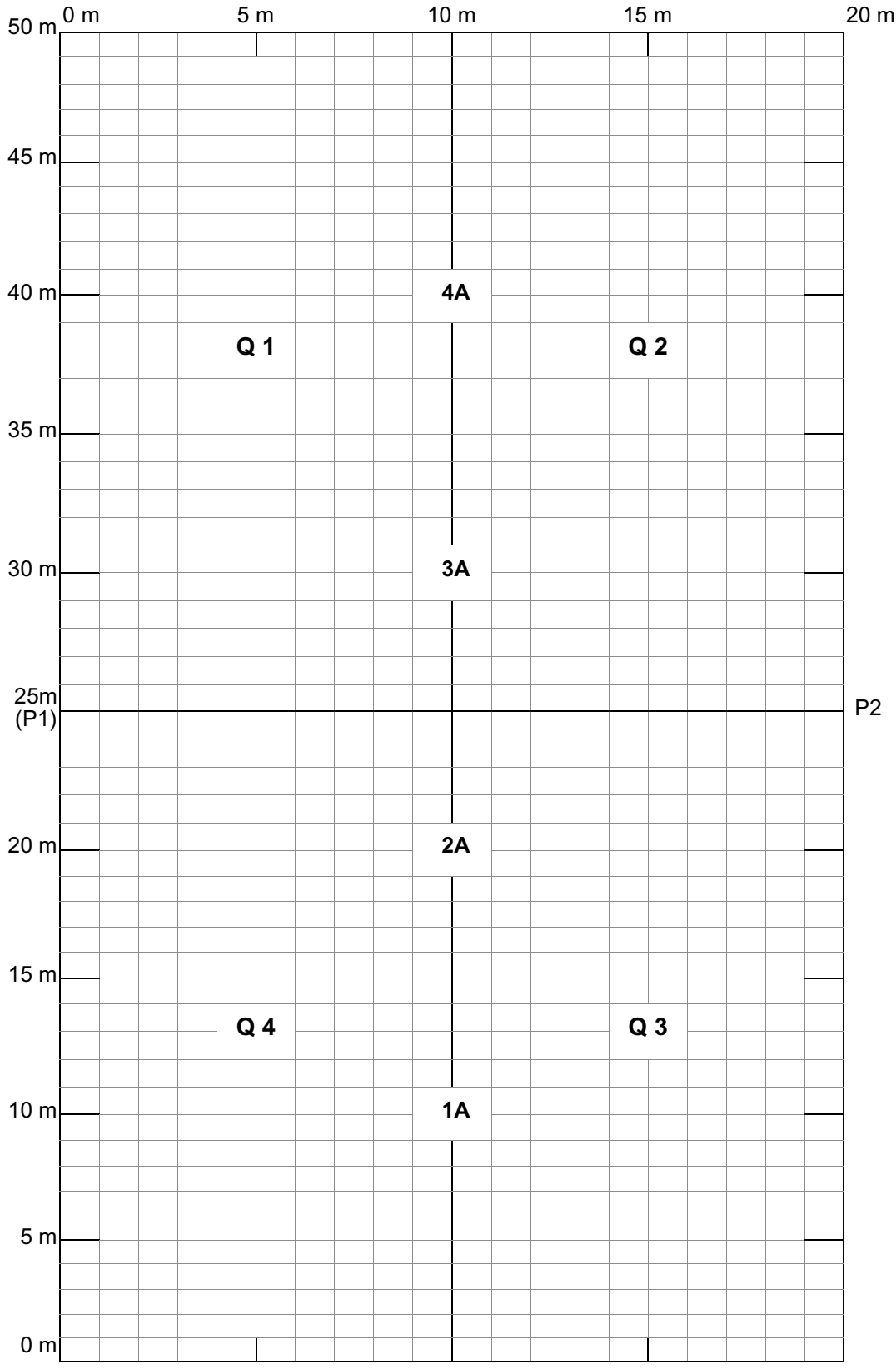
Tree Class

(Circle One)

Overstory

Pole

Seedling



Park/Unit 4-Character Alpha Code: _____

FMH-12 **QUARTER PLOT TREE MAP**

Plot ID: _____ B/C (Circle One) Date: ____/____/____

Burn Unit: _____ Recorders: _____

Burn Status:Circle one and indicate number of times treated, e.g., 01-yr01, 02-yr01

00-PRE ____ Post ____-yr01 ___-yr02 ___-yr05 ___-yr10 ___-yr20 Other: ___-yr____; ____-mo___

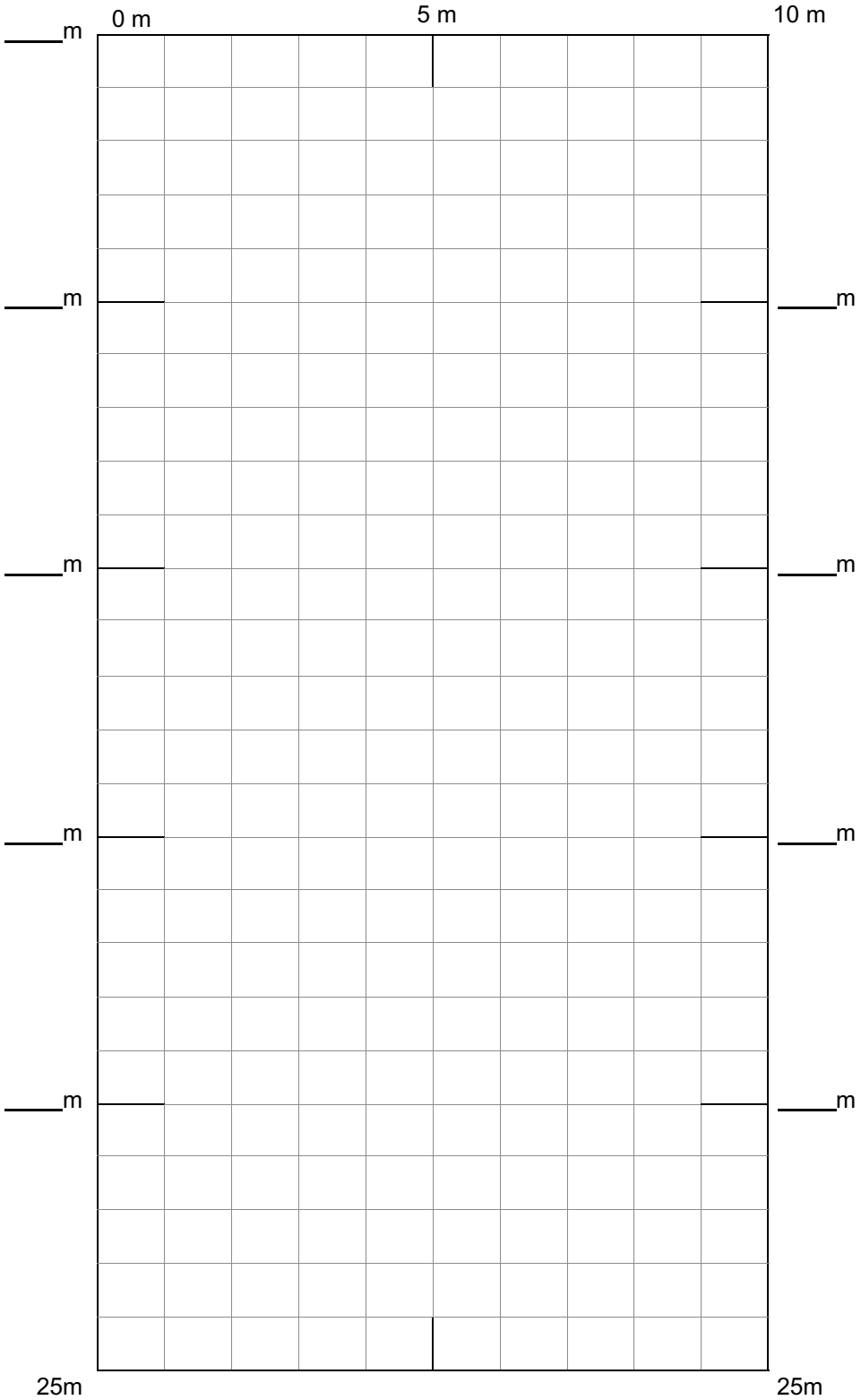
Tree Class

(Circle One)

Overstory

Pole

Seedling



Park/Unit 4-Character Alpha Code: _____

FMH-13 **ALTERNATE TREE MAP**

Plot ID: _____ B/C (Circle One) Date: ____/____/____

Burn Unit: _____ Recorders: _____

Burn Status:Circle one and indicate number of times treated, e.g., 01-yr01, 02-yr01

00-PRE ____ Post ____-yr01 ___-yr02 ___-yr05 ___-yr10 ___-yr20 Other: ___-yr____; ____-mo___

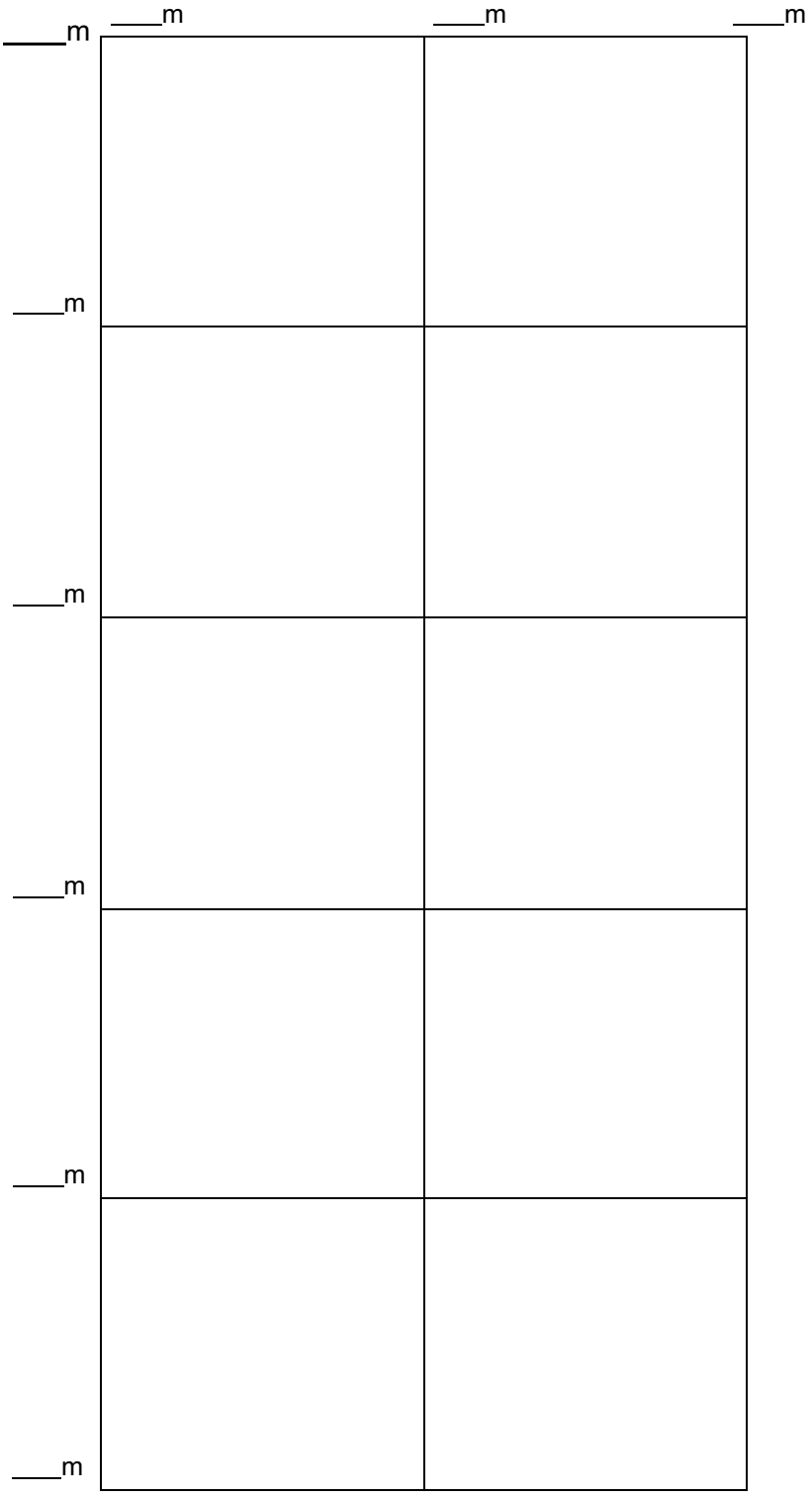
Tree Class

(Circle One)

Overstory

Pole

Seedling



Park/Unit 4-Character Alpha Code: _____

FMH-14

50 m^2 TREE MAP

Plot ID: _____ B/C (Circle One) Date: ____/____/____

Burn Unit: _____ Recorders: _____

Burn Status:Circle one and indicate number of times treated, e.g., 01-yr01, 02-yr01

00-PRE ____ Post ____-yr01 ___-yr02 ___-yr05 ___-yr10 ___-yr20 Other: ___-yr____; ____-mo___

Tree Class

(Circle One)

Overstory

Pole

Seedling